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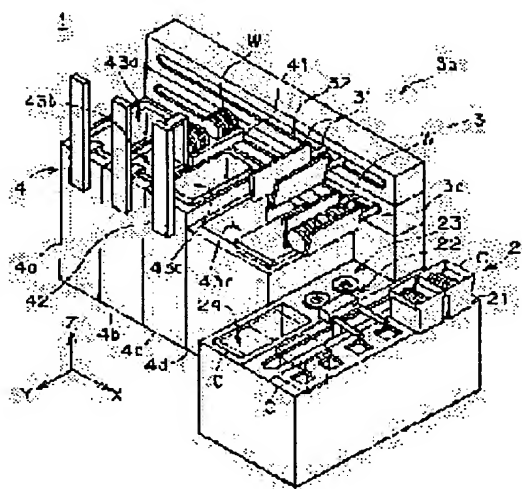
(72)Inventor : OGAMI NOBUTOSHI

(54) SUBSTRATE PROCESSOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a substrate processor capable of reducing the size of its whole and improving its throughput.

SOLUTION: In a substrate processor for applying a series of processing to a substrate (W), providing two carrying robots 3a, 3b for carrying the substrate W in an X direction, the deliveries or acceptances of the substrates W are performed between four processing portions 4a-4d arranged in the X- direction and both the carrying robots 3a, 3b. Also, providing a pair of holding plates 31 in each of both the carrying robots 3a, 3b, each of the pair of holding plates 31 can be turned from its front surface to rear surface and vice versa, to use properly the front and the rear surface of the holding plate 31 as the surfaces for holding thereon the substrates W with different surfaces conditions from each other. By the foregoing constitutions, the front and the rear surfaces of the holding plates 31 of the respective carrying robots 3a, 3b can accept respectively the substrates W from the different processing portions 4a-4d to make the necessities of the cleanings and dryings of the holding plates 31 eliminable. As a result, the size of the whole of the processor can be reduced and its throughput can be improved.



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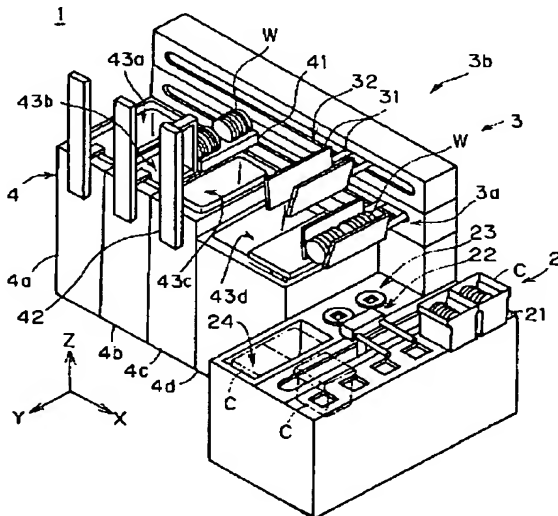
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(54)【発明の名称】 基板処理装置

(57)【要約】

【課題】 装置全体の小型化およびスループットの向上を図ることができる基板処理装置を提供する。

【解決手段】 基板Wに一連の処理を施す基板処理装置において、基板WをX方向に搬送する2つの搬送ロボット3a、3bを設けて、X方向に並んだ4つの処理部4a～4dと両搬送ロボット3a、3bとの間で基板Wの受渡を行う。また、両搬送ロボット3a、3bにはそれぞれ一対の保持板31を設けてこれらの保持板31の表裏を反転可能とし、保持板31の表裏を異なる表面状態の基板Wを保持する面として使い分ける。以上の構成により、各搬送ロボット3a、3bの保持板31の表裏2面はそれぞれ異なる処理部からの基板を受け取るようにすることができ、保持板31を洗浄したり乾燥したりする必要をなくすることができる。その結果、装置全体を小型化すると共にスループットを向上を図ることができる。



【特許請求の範囲】

【請求項 1】 基板に所定の一連の処理を施す基板処理装置であって、

前記基板に所定の処理を施す複数の処理部と、
前記複数の処理部の間において前記基板を搬送する複数の搬送手段と、を備え、

前記複数の処理部のそれぞれが、
前記複数の搬送手段と前記基板の受渡を行う受渡手段、を有し、

前記複数の搬送手段のそれぞれが、前記複数の処理部のうちあらかじめ当該搬送手段について割り当てられた一部の受渡手段からのみ前記基板を受け取ることを特徴とする基板処理装置。

【請求項 2】 請求項 1 記載の基板処理装置であって、前記複数の処理部のそれぞれの受渡手段が、前記複数の搬送手段のうちの特定の一の搬送手段のみに前記基板を渡すことを特徴とする基板処理装置。

【請求項 3】 請求項 1 または 2 記載の基板処理装置であって、
前記複数の処理部が所定の方向に配列されており、
前記複数の搬送手段が前記基板を前記所定の方向にのみ搬送することを特徴とする基板処理装置。

【請求項 4】 基板に所定の一連の処理を施す基板処理装置であって、
所定の方向に配列され、前記基板に所定の処理を施す複数の処理部と、

前記所定の方向に前記基板を搬送する第 1 および第 2 の搬送手段と、を備え、

前記複数の処理部のそれぞれが、
前記第 1 および第 2 の搬送手段と前記基板の受渡を行う受渡手段、を有し、

前記第 1 および第 2 の搬送手段のそれぞれが、
前記基板の前記所定の方向の搬送を案内する直線状の案内手段、を有し、前記第 1 および第 2 の搬送手段の前記案内手段が互いに平行に配置され、
前記第 1 および第 2 の搬送手段のそれぞれが、前記複数の処理部のうちの一部の受渡手段からのみ前記基板を受け取ることを特徴とする基板処理装置。

【請求項 5】 請求項 4 記載の基板処理装置であって、前記所定の方向が水平方向を向いており、
前記第 1 および第 2 の搬送手段の前記案内手段が互いに上下に平行に配置されていることを特徴とする基板処理装置。

【請求項 6】 請求項 4 記載の基板処理装置であって、前記所定の方向が水平方向を向いており、
前記第 1 および第 2 の搬送手段の前記案内手段が互いに段違平行に配置されていることを特徴とする基板処理装置。

【請求項 7】 請求項 4 記載の基板処理装置であって、前記所定の方向が水平方向を向いており、

前記第 1 および第 2 の搬送手段の前記案内手段の間に前記複数の処理部が配置されていることを特徴とする基板処理装置。

【請求項 8】 請求項 4 ないし 7 のいずれかに記載の基板処理装置であって、
前記受渡手段が、前記基板を昇降させる昇降手段であることを特徴とする基板処理装置。

【請求項 9】 請求項 4 ないし 8 のいずれかに記載の基板処理装置であって、

前記第 1 の搬送手段が、
前記基板に接触して保持する複数の保持面群を有する保持部と、

前記受渡手段から受け取る前記基板の処理段階に応じて前記複数の保持面群を切り替える切替手段と、をさらに有することを特徴とする基板処理装置。

【請求項 10】 請求項 9 記載の基板処理装置であって、

前記保持部が、
水平方向を向く互いに平行な 1 対の回転軸と、

前記 1 対の回転軸のそれぞれに沿って取り付けられ、表裏両面が保持面となっている 1 対の保持板と、を有し、
前記 1 対の保持板のそれぞれの 1 保持面が対をなすことにより前記複数の保持面群の 1 保持面群となっており、
前記基板の外縁部が前記 1 保持面群に当接して前記基板の主面の法線が前記 1 対の回転軸とほぼ同じ方向を向くように前記基板が保持され、
前記切替手段が、前記 1 対の保持板を前記 1 対の回転軸を中心としてそれぞれ回転させる手段であることを特徴とする基板処理装置。

【請求項 11】 請求項 9 記載の基板処理装置であって、

前記保持部が、
水平方向を向く互いに平行な 1 対の回転軸と、

前記 1 対の回転軸のそれぞれを中心軸とする略正多角柱状であって、前記中心軸に平行な面を保持面とする 1 対の保持体と、を有し、
前記 1 対の保持体のそれぞれの 1 保持面が対をなすことにより前記複数の保持面群の 1 保持面群となっており、
前記基板の外縁部が前記 1 保持面群に当接して前記基板の主面の法線が前記 1 対の回転軸とほぼ同じ方向を向くように前記基板が保持され、
前記切替手段が、前記 1 対の保持体を前記 1 対の回転軸を中心としてそれぞれ回転させる手段であることを特徴とする基板処理装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、半導体基板や液晶ディスプレイなどの製造に用いられるガラス基板など（以下、「基板」という。）を製造する際に、複数の処理部を用いて基板に処理を施す基板処理装置に関する。

【0002】

【従来の技術】複数の処理部において基板を処理する基板処理装置の例として、基板の表面にエッチングやレジスト膜剥離などの薬液処理を行う基板処理装置がある。このような基板処理装置では多槽型基板処理装置として、薬液を貯留した薬液槽と純水を貯留した純水洗浄槽とを備え、基板を薬液槽、純水洗浄槽に順次、浸漬させて基板に対して処理を施すものがある（以下、薬液槽や、純水洗浄槽を単に「薬液・純水洗浄槽」という。）。また、このような基板処理装置では最終の純水洗浄処理が完了した基板に乾燥処理を施す乾燥室も備えている。

【0003】一方、基板処理装置の中には単槽型基板処理装置として、1つの薬液・純水洗浄槽に薬液、純水を順次、交互に供給して薬液・純水洗浄槽内の薬液と純水とを順次、交互に置換することで基板を空気に触れさせることなく薬液処理、純水洗浄処理を行うものもある。また、このような基板処理装置では最終の純水洗浄が完了した基板に乾燥処理を施す乾燥室を備えるものや、前記1つの薬液・純水洗浄槽にて乾燥処理まで行うものもある（以下、薬液処理や、純水洗浄処理、そして、乾燥処理を単に「処理」という。）。 20

【0004】以上のような基板処理装置では、処理槽や乾燥室などに基板を搬送する搬送ロボットを有しているが、搬送ロボットの基板を保持する保持部には処理後の基板を保持する度に基板に付着している薬液や純水が付着することとなる。しかし、基板は僅かな汚染に対しても品質として大きな影響を受けるものであるため、搬送ロボットの保持部には基板を汚染しないようにする様々な工夫が必要となる。

【0005】そこで、基板処理装置に保持部を洗浄したり乾燥したりする機構を設け、常に洗浄や乾燥を行った保持部を用いて基板を保持し、搬送を行うようにしている。

【0006】

【発明が解決しようとする課題】しかし、基板処理装置に保持部を洗浄したり乾燥したりする機構を設けたのでは基板処理装置全体が大きくなってしまふと共に装置自体も複雑なものとなってしまふ。また、基板を保持する度に保持部を洗浄していたのではスループットが低減してしまうこととなる。 40

【0007】そこで、この発明は、上記課題に鑑みなされたもので、搬送ロボットの保持部の洗浄および乾燥を不要とする事により、基板処理装置の機構を複雑なものとする事なく、装置の小型化およびスループットの向上を図ることができる基板処理装置を提供することを目的とする。

【0008】

【課題を解決するための手段】請求項1の発明は、基板に所定の一連の処理を施す基板処理装置であって、前記 50

基板に所定の処理を施す複数の処理部と、前記複数の処理部の間において前記基板を搬送する複数の搬送手段とを備え、前記複数の処理部のそれぞれが、前記複数の搬送手段と前記基板の受渡を行う受渡手段を有し、前記複数の搬送手段のそれぞれが、前記複数の処理部のうちあらかじめ当該搬送手段について割り当てられた一部の受渡手段からのみ前記基板を受け取る。

【0009】請求項2の発明は、請求項1記載の基板処理装置であって、前記複数の処理部のそれぞれの受渡手段が、前記複数の搬送手段のうちの特定の一の搬送手段のみに前記基板を渡す。

【0010】請求項3の発明は、請求項1または2記載の基板処理装置であって、前記複数の処理部が所定の方向に配列されており、前記複数の搬送手段が前記基板を前記所定の方向にのみ搬送する。

【0011】請求項4の発明は、基板に所定の一連の処理を施す基板処理装置であって、所定の方向に配列され、前記基板に所定の処理を施す複数の処理部と、前記所定の方向に前記基板を搬送する第1および第2の搬送手段とを備え、前記複数の処理部のそれぞれが、前記第1および第2の搬送手段と前記基板の受渡を行う受渡手段を有し、前記第1および第2の搬送手段のそれぞれが、前記基板の前記所定の方向の搬送を案内する直線状の案内手段を有し、前記第1および第2の搬送手段の前記案内手段が互いに平行に配置され、前記第1および第2の搬送手段のそれぞれが、前記複数の処理部のうちの一部の受渡手段からのみ前記基板を受け取る。

【0012】請求項5の発明は、請求項4記載の基板処理装置であって、前記所定の方向が水平方向を向いており、前記第1および第2の搬送手段の前記案内手段が互いに上下に平行に配置されている。 30

【0013】請求項6の発明は、請求項4記載の基板処理装置であって、前記所定の方向が水平方向を向いており、前記第1および第2の搬送手段の前記案内手段が互いに段違平行に配置されている。

【0014】請求項7の発明は、請求項4記載の基板処理装置であって、前記所定の方向が水平方向を向いており、前記第1および第2の搬送手段の前記案内手段の間に前記複数の処理部が配置されている。

【0015】請求項8の発明は、請求項4ないし7のいずれかに記載の基板処理装置であって、前記受渡手段が、前記基板を昇降させる昇降手段である。

【0016】請求項9の発明は、請求項4ないし8のいずれかに記載の基板処理装置であって、前記第1の搬送手段が、前記基板に接触して保持する複数の保持面群を有する保持部と、前記受渡手段から受け取る前記基板の処理段階に応じて前記複数の保持面群を切り替える切替手段とをさらに有する。

【0017】請求項10の発明は、請求項9記載の基板処理装置であって、前記保持部が、水平方向を向く互い

に平行な1対の回転軸と、前記1対の回転軸のそれぞれに沿って取り付けられ、表裏各面が保持面となっている1対の保持板とを有し、前記1対の保持板のそれぞれの一保持面が対をなすことにより前記複数の保持面群の一保持面群となっており、前記基板の外縁部が前記一保持面群に当接して前記基板の主面の法線が前記1対の回転軸とほぼ同じ方向を向くように前記基板が保持され、前記切替手段が、前記1対の保持板を前記1対の回転軸を中心としてそれぞれ回転させる手段である。

【0018】請求項11の発明は、請求項9記載の基板処理装置であって、前記保持部が、水平方向を向く互いに平行な1対の回転軸と、前記1対の回転軸のそれぞれを中心軸とする略正多角柱状であって、前記中心軸に平行な面を保持面とする1対の保持体とを有し、前記1対の保持体のそれぞれの一保持面が対をなすことにより前記複数の保持面群の一保持面群となっており、前記基板の外縁部が前記一保持面群に当接して前記基板の主面の法線が前記1対の回転軸とほぼ同じ方向を向くように前記基板が保持され、前記切替手段が、前記1対の保持体を前記1対の回転軸を中心としてそれぞれ回転させる手段である。

【0019】

【発明の実施の形態】

<1. 第1の実施の形態>

<1. 1 全体構成>図1はこの発明の一の実施の形態である基板処理装置1を示す斜視図である。また、図2は基板処理装置1を(+X)方向から(-X)方向を向いて見たときの各構成要素の配置の概略を示した図である。

【0020】この基板処理装置1は複数枚の基板W(以下、単に「基板W」という。)を一括して処理する装置であり、この装置は図1に示すようにカセットCにセットされた基板Wを装置外部との間で受け渡す搬出入部2、搬出入部2に搬入された基板Wを受け取って搬送する搬送部3、搬送部3から基板Wを受け取って所定の一連の処理を施す処理ユニット4から構成されている。

【0021】搬出入部2は、搬入された(あるいは搬出直前の)基板WをカセットCにセットして一時的にY方向に並べて載置しておくカセット台21、Y方向に移動するとともにZ方向に昇降可能とされ、また、Z軸に平行な軸を中心に回転可能となっている移載ロボット22、移載ロボット22により載置されたカセットCから基板Wを下方より突き上げて搬送部3に渡す突上部23、および、空のカセットCを洗浄するカセット洗浄部24から構成される。

【0022】搬送部3は、X方向にのみ移動可能であり、突上部23から受け取った基板Wを処理ユニット4に渡し、所定の処理が完了した基板を突上部23に返却する第1搬送ロボット3aおよび第2搬送ロボット3bから構成され、第2搬送ロボット3bは第1搬送ロボッ

トの3aの直上位置に配置されている。

【0023】第1および第2搬送ロボットは3a、3bは、それぞれY方向に伸びる保持板31を1対ずつ有しており、1対の保持板31に挟まれるようにして起立姿勢の複数の基板をY方向に並べて保持するようになっている。また、これらの1対の保持板31はそれぞれY方向に伸びる軸33に取り付けられており(図2参照)、これらの軸を中心として回転するようになっている。

【0024】図3(a)および(b)は基板Wを保持した状態の保持板31の様子を(+Y)方向から(-Y)方向を向いて見たときの側面図である。2つの保持板31は矢印R1に示すように軸33を中心に互いに反対方向に同じ回転角だけ回転するようになっている、それぞれの保持板31の表裏両面である保持面31a、31bは対となって基板Wを保持するようになっている。すなわち、図3(a)に示すように基板Wが保持されるときに一方の保持板31が基板Wに対して保持面31aを向けているときは常に他方の保持板31も保持面31aを基板Wに向けており、図3(b)に示すように一方の保持板31が基板Wに対して保持面31bを向けているときは常に他方の保持板31も保持面31bを基板Wに向けるようになっている。これにより、例えば、図3(a)に示すように乾燥した基板W1は1対の保持面31aを用いて保持し、図3(b)に示すように薬液が付着した基板W2は1対の保持面31bを用いて保持するようになると、基板Wへの不要な液を付着を考慮することなく1対の保持板31を用いて2つの表面状態の基板W1、W2を保持することが可能となる。

【0025】なお、各保持板31の表裏両面である2つの保持面31a、31bには基板Wをその主面の法線がY方向を向いて保持されるように複数の溝GがY方向に垂直な方向に形成されており、2つの保持板31がY-Z面に平行な状態で基板Wをその間に配置し、その後両保持板31を回転させて基板Wを挟み込むようにして保持するようになっている。

【0026】第1および第2搬送ロボット3a、3bの各保持板31は軸33を介してX方向に伸びる直動手段32(駆動源と案内手段とを兼ね備えたもの)によりX方向に移動するようになっている(図1、図2参照)。したがって、突上部23において突き上げられた基板Wは第1および第2搬送ロボット3a、3bにより保持されて処理ユニット4上をX方向に搬送されることとなる。

【0027】処理ユニット4は、基板Wに薬液処理を施す薬液処理部4a、基板Wに純水洗浄処理を施す純水洗浄処理部4b、薬液・純水処理部4c、および、基板Wに乾燥処理を施す乾燥処理部4d(以下、これらを総称して「処理部」という。)から構成されている。また、これらの処理部はX方向に並んで配置されており、この上を第1および第2搬送ロボット3a、3bの保持板3

1が移動するようになっている。

【0028】薬液処理部4aは薬液を貯留する薬液槽43aを有し、薬液槽43aは図2に示すように薬液を供給する処理液供給部44に接続されている。また、薬液槽43aからあふれ出した薬液は排出部45から排出され図示しない温度調節手段、濾過手段を通じて再び処理液供給部44を通じて薬液槽43aに循環される。この薬液槽43aでは温度調節手段が設けられてかつ薬液を循環させていることから、比較的高温度、高濃度の薬液による薬液処理が行われる。

【0029】純水洗浄処理部4bは純水洗浄槽43bを有する。純水洗浄槽43bは下部から純水が供給され上部から純水があふれ出すようになっており、薬液槽43aで薬液処理が施された後の基板Wが持ち込まれたとき、該基板Wに付着した薬液を純水で洗い流して除去する。

【0030】薬液・純水洗浄処理部4cは1つの薬液・純水洗浄槽43cを有する。薬液・純水洗浄槽43cの下部からは薬液、純水がそれぞれ順次、交互に所定時間供給される。これによって、薬液・純水洗浄槽43c内は薬液、純水に交互に置き換わる。よって、純水洗浄槽43bにて純水洗浄処理が施された後、この薬液・純水洗浄槽43cに浸漬された基板Wは空気に触れることなく薬液処理、純水洗浄処理を施される。

【0031】この薬液・純水洗浄槽43cでは薬液と純水とが交互に置換されることから薬液槽43aで用いられる薬液に比べて低温度、低濃度の薬液による薬液処理が行われる。なお、乾燥処理部4dについては乾燥処理が行われる乾燥室43dが設けられている。

【0032】また、薬液槽43a、純水洗浄槽43b、薬液・純水洗浄槽43cはそれぞれ基板Wを保持する保持台41と保持台41を上下に昇降させる昇降手段42を有している。乾燥処理部4dも形態は異なるが、乾燥室43dから基板Wを出し入れする昇降手段および保持台を有している(図示省略)。これにより、各処理部と第1および第2搬送ロボット3a、3bとは基板Wの受け渡しが可能とされており、基板Wに薬液処理、純水洗浄処理、および、乾燥処理を施すことができるようになっている。

【0033】<1. 2 動作>次に、この基板処理装置1の動作について図1および図4を用いて説明する。

【0034】まず、図1に示すように基板WはカセットCにセットされた状態で装置外部から搬送車などの手段により搬送されてカセット台21上に載置される。カセット台21に載置されたカセットは移載ロボット22により突上部23に載置される。なお、突上部23にはカセットCが同時に2つ載置可能になっており、ここで、カセットCがZ方向を向く軸を中心として90度回転された後、2つのカセットC内部の基板Wが同時に上方へと突き上げ取り出される。空になったカセットCは、再

び移載ロボット22に把持されてカセット洗浄部24へと格納され、基板Wに所定の一連の処理が施されている間に洗浄処理が施される。

【0035】突上部23により突き上げられた基板Wは図4に示すように第1搬送ロボット3aに保持されながら矢印P11に示すように薬液処理部4aへと搬送される。なお、このとき基板Wは第1搬送ロボット3aの保持板31の1対の保持面31a(図3(a)参照)により保持される。

10 【0036】薬液処理部4aへと搬送された基板Wは第1搬送ロボット3aから保持台41へと受け渡しされ、昇降手段42により薬液槽43a内部の薬液に浸漬される。ここで基板Wには薬液処理が施され、その後、昇降手段42により取り出される。

【0037】薬液槽43aから取り出された基板Wは保持台41から第1搬送ロボット3aへと再び渡される。このとき、第1搬送ロボット3aは保持板31の1対の保持面31b(図3(b)参照)にて受け取る。したがって、保持面31bには基板Wに付着している薬液が付着するが保持面31aには付着することはない。

20 【0038】薬液処理部4aから基板Wを受け取った第1搬送ロボット3aは、次に、矢印P12に示すように純水洗浄処理部4bへと基板Wを搬送し、薬液処理部4aと同様、基板Wを保持台41に渡す。そして第1搬送ロボット3aは次の処理されるべき基板Wを受け取るために矢印P14に示すように再び突上部23へと移動する。純水洗浄処理部4bは受け取った基板Wに純水洗浄処理を施し、基板Wに付着した薬液を洗い流す。そして、第2搬送ロボット3bへと基板Wを渡す。このとき、第2搬送ロボット3bは保持面31aにて基板Wを受け取り、該保持面31aには純水が付着する。

30 【0039】純水洗浄処理部4bから基板Wを受け取った第2搬送ロボット3bは矢印P13に示すように薬液・純水洗浄処理部4cに基板Wを渡す。

【0040】以上のように第1搬送ロボット3aでは、保持板31の1対の保持面31aは基板処理装置1へ搬入された直後の基板Wを保持するためにのみ用いられ、1対の保持面31bは薬液処理部4aでの薬液処理後の基板Wを受け取るためにのみ用いられている。したがって、保持面31aには液が付着することなく、保持面31bには薬液のみが付着することとなる。

40 【0041】基板Wを第2搬送ロボット3bから受け取った薬液・純水洗浄処理部4cは基板Wを昇降させてさらに他の薬液処理および純水洗浄処理を基板Wに施し、この基板Wを第2搬送ロボット3bに渡す。このとき、第2搬送ロボット3bは2つの保持板31の1対の保持面31aを用いて基板Wを保持する。このとき保持面31aは純水洗浄処理部4bから渡された基板Wに接触しているため純水が付着しているが、薬液・純水洗浄処理部4cから渡される基板Wも純水が付着しているので問

題はない。

【0042】第2搬送ロボット3bは薬液・純水洗浄処理部4cから受け取った基板Wを矢印P15に示すように乾燥処理部4dの上方へと搬送する。ここで、乾燥処理部4dの保持台が基板Wを受け取って乾燥処理を施し、乾燥した基板Wを再び第2搬送ロボット3bに渡す。このとき、第2搬送ロボット3bは保持板31の1対の保持面31bを用いて基板Wを受け取る。すなわち、第2搬送ロボット3bにおいては保持面31aは純水洗浄処理部4b、薬液・純水洗浄処理部4cにて純水洗浄処理が施された後の純水が付着した基板Wを保持するためにのみ用いられ、保持面31bは乾燥処理が施された後の乾燥した基板Wを保持するためにのみ用いられることとなる。なお、基板Wを乾燥処理部4dから受け取った第2搬送ロボット3bは矢印P16に示すように突上部23へと基板Wを搬送して突上部23に基板Wを返却する。そして、次の基板を受け取るために矢印P17に示すように純水洗浄処理部4bへと移動する。

【0043】突上部23ではカセット洗浄部24にて洗浄されたカセットCが移載ロボット22を用いて配置され、処理後の基板Wがこの中に格納される（図1参照）。そして、処理が施された基板WがセットされたカセットCはカセット台21に載置されて装置外部へと搬出されていく。

【0044】<1. 3 効果>以上、第1の実施の形態における基板処理装置1の構成および動作について説明してきたが、この基板処理装置1はこのように第1および第2搬送ロボット3a、3bを有し、かつ、各搬送ロボットは基板Wを保持する保持面の対を2つ有している。これらの保持面31a、31bを使い分けることにより、各保持面は特定の表面状態の基板Wのみを保持することができる。その結果、保持板31自体に洗浄や乾燥を施すことなく、基板Wに悪影響を与える液や汚染物質の付着を防止することができる。また、これにより、装置の小型化およびスループットの向上を図ることができる。

【0045】さらに、この基板処理装置1では第1および第2搬送ロボット3a、3bが上下に配置されているので、装置の占有床面積の低減も図ることができる。また、この基板処理装置1では、各処理部がX方向に配列されており、直動手段32や昇降手段42は1軸の移動機構であるので、基板Wの受渡の際の位置決めを正確に行うことができ、迅速で信頼性の高い受渡を容易に実現することができる。

【0046】<1. 4 搬送ロボットの配置変形例>図5はこの発明の第1の実施の形態である基板処理装置1において第2搬送ロボット3bの配置が変更されたもの（図中符号3c）を示す図であり、第1の実施の形態における図2に相当する図である。

【0047】この第2搬送ロボット3cは図2に示され

る第2搬送ロボット3bと異なり、直動手段32が第1搬送ロボット3aの直動手段32に対して側方上方に平行に（段違平行に）に配置されている。したがって、第2搬送ロボット3cの保持板31が取り付けられた軸33は第1搬送ロボット3aのものよりも長いものとなっている。

【0048】このように、第1および第2搬送ロボット3a、3cを段違い平行に配置することにより、両搬送ロボットの保持板31の上下方向の距離を第1の実施の形態の基板処理装置1に比べて小さくすることができる。また、各処理部に設けられている昇降手段42sは第1の実施の形態のものに比べて低く押さえることができる。その結果、この基板処理装置は第1の実施の形態の基板処理装置1に比べて高さ方向に対して低く押さえられている。これにより、搬送ロボットを2つ有するために装置全高が高くなるという問題が克服されている。また、基板Wの高さ方向の搬送経路も短く押さえられることとなり、スループットも向上される。

【0049】さらに、第1の実施の形態では搬送ロボットは2つであるが、これは説明の便宜上2つのものを示したに過ぎず、もちろん3つ以上であってもよい。この場合、特定の種類の処理部から取り出される特定の表面状態の基板を受け取る搬送ロボットを特定のものに決めておけば（2つ以上であってもよい）、基板Wを保持する部位の洗浄・乾燥を不要とすることが可能であり、上記効果を得るようにすることができる。なお、処理内容によっては任意の搬送ロボットが受け取るようにしてもよい。このような場合であっても搬送ロボットが多いほどスループットの向上を図ることができる。

【0050】<1. 5 処理ユニットの変形例>図6は第1の実施の形態に示す基板処理装置1の処理ユニット4の構成を変形した例を示す動作図である。この変形例では、処理ユニット4は薬液処理のみを行う薬液処理部4e、純水洗浄処理のみを行う純水洗浄処理部4f、および、乾燥処理を行う乾燥処理部4dから構成されている。薬液処理部4eは第1の実施の形態と同様、薬液槽を有している。また、純水洗浄処理部4fも純水のみが供給されて貯留されている洗浄槽を有している。なお、搬出入部2および搬送部3については第1の実施の形態と同様である。

【0051】この基板処理装置では、第1搬送ロボット3aが保持板31の1対の保持面31aを用いて突上部23から基板Wを受け取り、矢印P21に示すように搬送して薬液処理部4eに基板Wを渡す。基板Wは薬液処理部4eの薬液槽にて浸漬されて処理された後再び第1搬送ロボット3aに基板Wを渡すが、このとき第1搬送ロボット3aは1対の保持面31bを用いて基板Wを保持する。第1搬送ロボット3aは基板Wを矢印P22に示すように搬送して純水洗浄処理部4fに渡し、次の基板を受け取りに矢印P23に示すように再び突上部23

へと移動する。

【0052】第2搬送ロボット3bは、純水洗浄処理が施された基板Wを純水洗浄処理部4fから保持板31の1対の保持面31aを用いて受け取り、矢印P24に示すように搬送して乾燥処理部4dに渡す。乾燥処理が施された基板Wは再び第2搬送ロボット3bに渡され、矢印P25に示すように突上部23へと搬送される。このとき、第2搬送ロボット3bは1対の保持面31bを用いて基板Wを搬送する。そして、突上部23に基板Wを渡すと次の基板を受け取るために純水洗浄処理部4fへと矢印P26に示すように移動する。

【0053】このように、この変形例では、第1搬送ロボット3aの1対の保持板31の1対の保持面31aは未処理の基板Wを搬送するために用いられ、1対の保持面31bは薬液処理後の基板Wを搬送するために用いられている。また、第2搬送ロボット3bの1対の保持板31の1対の保持面31aは純水洗浄処理後の基板Wを搬送するために用いられ、1対の保持面31bは乾燥処理後の基板Wを搬送するために用いられている。

【0054】＜2. 第2の実施の形態＞図7はこの発明の第2の実施の形態である基板処理装置を第1の実施の形態における図2と同様（+X）方向から（-X）方向を向いて見た図であり、図2と同様の構成要素のみ図示している。また、図8は第1搬送ロボット3dにおいて第1の実施の形態における保持板31に代えて取り付けられている保持体34を示す図であり、図9は第2搬送ロボット3eと同様に取り付けられている保持アーム35を示す図である。さらに、図10はこの基板処理装置の動作を示す図である。

【0055】図7に示すように、第1搬送ロボット3dは第1の実施の形態における2つの保持板31に代えてY方向に伸びる2つの正三角柱の保持体34となっている。すなわち、保持板31では表裏2面である保持面31a、31bが基板Wの表面状態に応じて切り替えられたが、この実施の形態では三角柱の3つの側面である保持面34a、34b、34cがその役割を果たすようになっている。この保持体34を（+Y）方向から（-Y）方向を向いて見た状態を示したものが図8である。2つの保持体34のそれぞれの3つの保持面は第1の実施の形態と同様に軸33を中心に矢印R2の方向に回転して対となって切り替えられるようになっており、それぞれの保持面には基板Wを起立姿勢にて保持できるように複数の溝Gが形成されている。

【0056】また、第2搬送ロボット3eは処理ユニット4を挟んで第1搬送ロボット3dと対向して設けられており、各処理部の昇降手段42sの上方を通して伸びる1対の軸33のそれぞれに保持アーム35が取り付けられたものとなっている。この保持アーム35を（-Y）方向から（+Y）方向を向いて見た状態を示したものが図9であり、保持アーム35が矢印R3に示すよう

に開閉することにより、基板Wを抱え込んで保持するようになっている。

【0057】この基板処理装置の処理ユニット4は図10に示すように、第1薬液処理部4g、第1純水洗浄処理部4h、第2薬液処理部4i、第2純水洗浄処理部4j、および、乾燥処理部4dがこの順で（-X）方向から（+X）方向に向かって配置されており、各薬液処理部および各純水洗浄処理部には薬液や純水が貯留されている。なお、第1および第2薬液処理部4g、4iに貯留されている薬液は同種または混合しても問題を生じない（有害ガスを発生しないなど）ものとなっている。また、他の構成要素は第1の実施の形態と同様である。

【0058】以下、この基板処理装置の動作を図10を用いて説明する。

【0059】まず、第1搬送ロボット3dは1対の保持面34aを用いて突上部23から基板Wを受け取って矢印P31に示すように搬送して第1薬液処理部4gに渡す。そして、矢印P32、P33、P34、P35に示すように順に、第1薬液処理部4gから1対の保持面34bを用いて基板Wを受け取り第1純水洗浄処理部4hに渡し、第1純水洗浄処理部4hから1対の保持面34cを用いて基板Wを受け取り第2薬液処理部4iに渡し、第2薬液処理部4iから1対の保持面34bを用いて基板Wを受け取り第2純水洗浄処理部4jに渡し、第2純水洗浄処理部4jから1対の保持面34cを用いて基板Wを受け取り乾燥処理部4dに渡す。その後、矢印P36に示すように第1薬液処理部4gへと戻る。

【0060】一方、第2搬送ロボット3eは、乾燥処理部4dから基板Wを受け取って矢印P37に示すように搬送して突上部23に渡し、矢印P38に示すように元の位置に戻る。

【0061】このような動作を行うことにより、保持体34の保持面34aは未処理の基板Wのみと接触し、保持面34bは薬液が付着した基板Wのみと接触し、保持面34cは純水が付着した基板Wのみと接触することとなる。また、第1および第2薬液処理部4g、4iの薬液は同種または混合可能なものであるため、これらの処理部から保持面34bを用いて基板Wを受け取るようにしても問題は生じない。したがって、第1の実施の形態と同様、保持体34や保持アーム35の洗浄や乾燥を不要とし、装置の小型化やスループットの向上を図ることができる。

【0062】また、この実施の形態では第1および第2搬送ロボット3d、3eは十分離れて配置することができるので、各搬送ロボットの配置を容易に決定することができ、かつ、保持体34と保持アーム35とに保持される基板Wの距離を小さくすることができ、装置全高を低く押さえたり短い上下移動によるスループットの向上を図ることができる。

【0063】＜3. 第3の実施の形態＞図11はこの

発明の第3の実施の形態である基板処理装置の保持体36を示す図であり、図12は動作を示す図である。

【0064】この基板処理装置では、第1の実施の形態の基板処理装置1と比べて、第1搬送ロボット3fが保持板31に代えて図11に示すような底面が正方形の角柱をした保持体36を有している点で相違し、また、処理ユニット4も第2の実施の形態と同様の形態となっている。ただし、第1および第2薬液処理部4g、4iに貯留されている薬液は例えば酸とアルカリ等互いに混合してはならないものである。

【0065】図11に示すように保持体36が四角柱であるので、第2の実施の形態における保持体34に対してさらに1対の保持面を多く有している。すなわち、各保持体36は保持面36a、36b、36c、36dの4つの保持面を有しており、両保持体36が矢印R4に示すように軸33を中心として反対方向に回転することにより、両保持体36の対応する保持面が対をなして基板Wを保持するようになっている。したがって、4つの異なる表面状態の基板Wを保持することができるようになっている。

【0066】また、第2搬送ロボット3bは第1の実施の形態と同様に2つの保持面31a、31bを有する保持板31を1対有している。

【0067】このような第1および第2搬送ロボット3f、3bを備えたこの基板処理装置の動作は図12に示すように、まず、突上部23から第1搬送ロボット3fが1対の保持面36aを用いて基板Wを受け取り、矢印P41に示すように搬送して第1薬液処理部4gに渡す。以下、順に矢印P42、P43、P44に示すように第1薬液処理部4gから第1純水洗浄処理部4hへ保持面36bを用いて搬送し、第1純水洗浄処理部4hから第2薬液処理部4iへ保持面36cを用いて搬送し、第2薬液処理部4iから第2純水洗浄処理部4jへ保持面36dを用いて搬送する。その後、次の基板を受け取るために矢印P45に示すように突上部23へと移動する。

【0068】次に、第2搬送ロボット3bは矢印P46、P47に示すように第2純水洗浄処理部4jから乾燥処理部4dへ保持面31aを用いて基板Wを搬送し、乾燥処理部4dから突上部23へと保持面31bを用いて搬送する。その後、次の基板を受け取るために矢印P48に示すように第2純水洗浄処理部4jへと移動する。

【0069】以上のような搬送動作により、各処理部からの基板Wの受け取りは第1および第2搬送ロボット3f、3bの異なる保持面で行われるので、たとえ第1および第2薬液処理部4g、4iに貯留されている薬液が混ざってはならないものであっても保持体36や保持板31の洗浄などを行うことなく基板Wを安全に取り扱うことができる。もちろん、第1の実施の形態と同様、

装置の小型化やスループットの向上も図ることができる。

【0070】<4. 変形例>以上この発明の実施の形態について説明してきたが、この発明は上記実施の形態に限定されるものではない。

【0071】例えば、上記実施の形態では搬送ロボットが2つであったが、既述のように3つ以上であってもよい。また、処理ユニット4の処理部の数も上記実施の形態に限定されるものではない。これらは処理内容に応じて適宜決定されるものである。

【0072】また、搬送ロボットの保持板31や保持体34、36も上記実施の形態に限定されるものではなく、複数の表面状態の基板を搬送できるのであれば、どのような形態であってもよい。例えば、保持体として正六角柱状のものをを用い、1対の保持体間の間隔を変更可能とすると共に、6つの側面を切り替えて保持するようにしてもよい。なお、1対の保持体間の間隔を変更可能とするのは、基板の下方に保持体を移動させるために両保持体間の間隔を基板の直径より大きくするためである。

【0073】また、基板Wの処理が完了する前に次の基板の処理を開始するようにしてももちろんよい。

【0074】また、保持板31や保持体34、36などの保持面を有する搬送ロボットにおいて、可能であれば異なる表面状態の基板Wを同一の保持面で保持するようにしてもよいし、異なる保持面において同じ表面状態の基板Wを保持するようにしてもよい。

【0075】その他、処理内容や搬送ロボットへの基板Wの受け渡しなどについても適宜変更が可能である。

【0076】

【発明の効果】以上説明したように、請求項1記載の発明では、複数の搬送手段のそれぞれが、複数の処理部のうちあらかじめ割り当てられた一部の処理部の受渡手段からのみ基板を受け取るので、各搬送手段は所定の処理を終えた特定の表面状態の基板のみを搬送することができる。これにより、各搬送手段の基板を保持する保持部を洗浄したり乾燥したりする必要をなくすことができ、基板処理装置の小型化やスループットの向上を図ることができる。

【0077】請求項2記載の発明では、各処理部の受渡手段は特定の1の搬送手段のみに基板を渡すので、各搬送手段は所定の処理を終えた特定の表面状態の基板のみを搬送することとなる。これにより、請求項1記載の発明と同様、各搬送手段の基板を保持する保持部を洗浄したり乾燥したりする必要をなくすことができ、基板処理装置の小型化やスループットの向上を図ることができる。

【0078】請求項3記載の発明では、複数の処理部が所定の方向に配列されており、複数の搬送手段が基板を所定の方向にのみ搬送するので、簡易な構造にて基板を

各処理部へと搬送することができる。

【0079】請求項4記載の発明では、第1および第2の搬送手段のそれぞれが、複数の処理部の一部の処理部の受渡手段からのみ基板を受け取るので、各搬送手段は所定の処理を終えた特定の表面状態の基板のみを搬送することができる。これにより、各搬送手段の基板を保持する保持部を洗浄したり乾燥したりする必要をなくすことができ、基板処理装置の小型化やスループットの向上を図ることができる。

【0080】請求項5記載の発明では、第1および第2の搬送手段の案内手段が上下に平行に配置されているので、基板処理装置が占める床面積を小さく押さえることができる。

【0081】請求項6記載の発明では、第1および第2の搬送手段の案内手段が段違平行に配置されているので、第1の搬送手段に保持される基板と第2の搬送手段に保持される基板との上下方向の距離を小さくすることができ、基板処理装置の全高を低く押さえることができると共に、各処理部から基板を受け取るために基板を移動しなければならない距離を短くすることができ、スループットの向上を図ることができる。

【0082】請求項7記載の発明では、第1および第2の搬送手段の案内手段の間に複数の処理部が配置されているので、請求項6記載の発明の効果に加えて各搬送手段の配置の設計を容易に行うことができる。

【0083】請求項8記載の発明では、受渡手段が基板を昇降させる昇降手段であるので、基板の受渡における基板の位置決めを正確に行うことができる。

【0084】請求項9記載の発明では、保持面群を切り替えて基板を保持するので、異なる表面状態の基板を汚染することなく1つの搬送手段にて容易に保持することができる。

【0085】請求項10記載の発明では、1対の保持板の表裏面である保持面を切り替えて基板を保持するので、2つの表面状態の基板を汚染することなく容易に保持することができる。

【0086】請求項11記載の発明では、1対の略正多角柱状の保持体を中心軸を中心に回転させることにより保持面を切り替えて基板を保持するので、3以上の異なる表面状態の基板を汚染することなく容易に保持することができる。

【図面の簡単な説明】

【図1】この発明の第1の実施の形態における基板処理

装置全体の斜視図である。

【図2】図1に示す基板処理装置の構成を示す側面図である。

【図3】保持板を示す側面図である。

【図4】図1に示す基板処理装置の動作を示す図である。

【図5】図1に示す基板処理装置の一の変形例を示す側面図である。

【図6】図1に示す基板処理装置の他の変形例の動作を示す図である。

【図7】この発明の第2の実施の形態における基板処理装置の構成を示す側面図である。

【図8】保持体を示す側面図である。

【図9】保持アームを示す側面図である。

【図10】図7に示す基板処理装置の動作を示す図である。

【図11】保持体を示す側面図である。

【図12】この発明の第3の実施の形態における基板処理装置の動作を示す図である。

【符号の説明】

1 基板処理装置

3a、3d、3f 第1搬送ロボット

3b、3c、3e 第2搬送ロボット

4 処理ユニット

4a 薬液処理部

4b 純水洗浄処理部

4c 薬液・純水洗浄処理部

4d 乾燥処理部

4e 薬液処理部

4f 純水洗浄処理部

31 保持板

31a、31b 保持面

32 直動手段

33 軸

34 保持体

34a、34b、34c 保持面

36 保持体

36a、36b、36c、36d 保持面

41 保持台

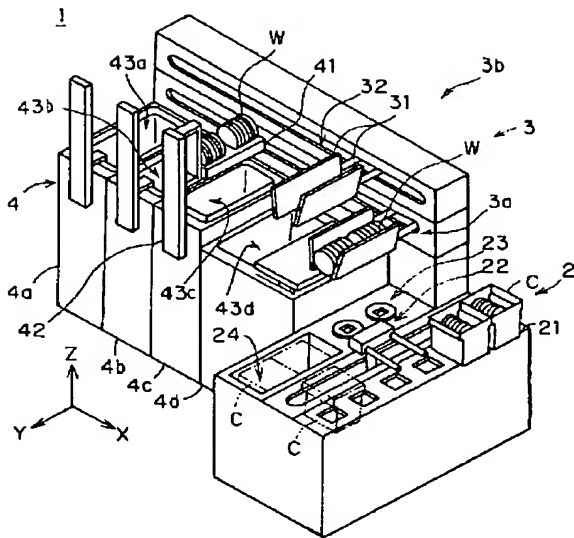
42 昇降手段

G 溝

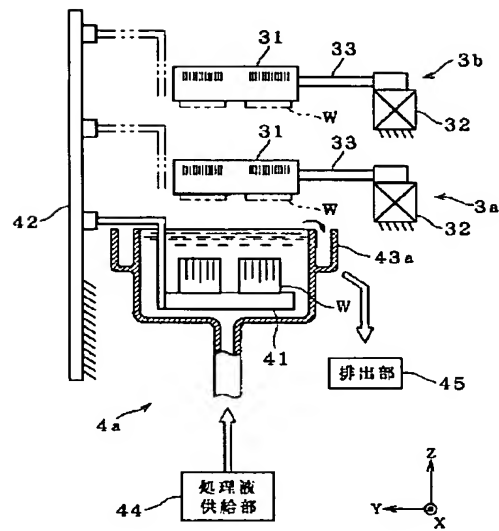
R1、R2、R3 矢印

W 基板

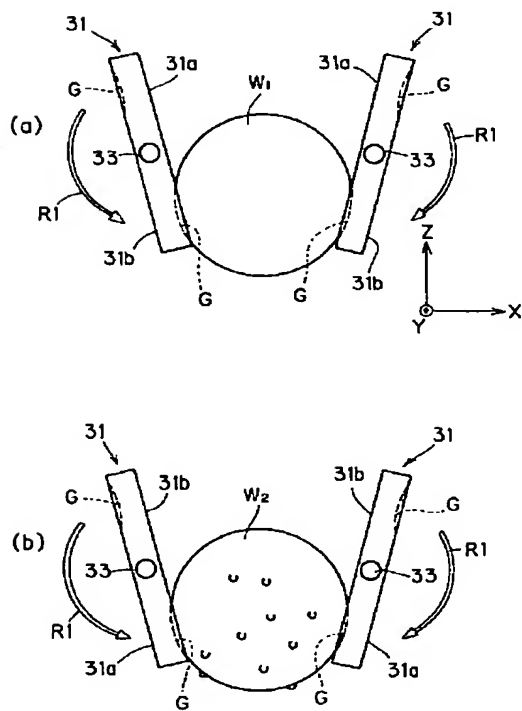
【図1】



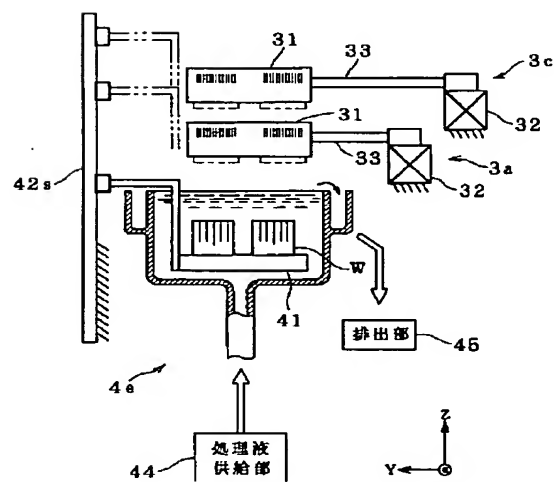
【図2】



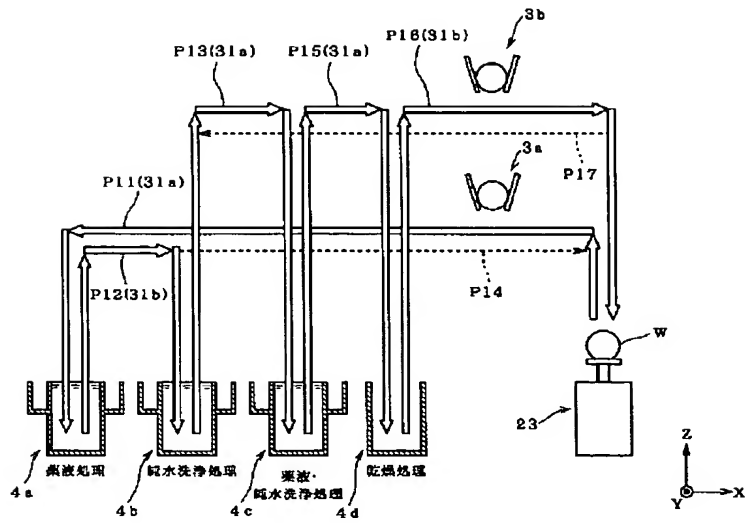
【図3】



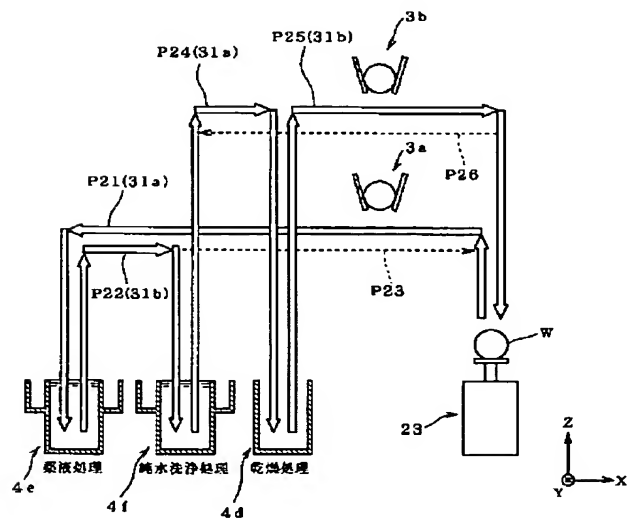
【図5】



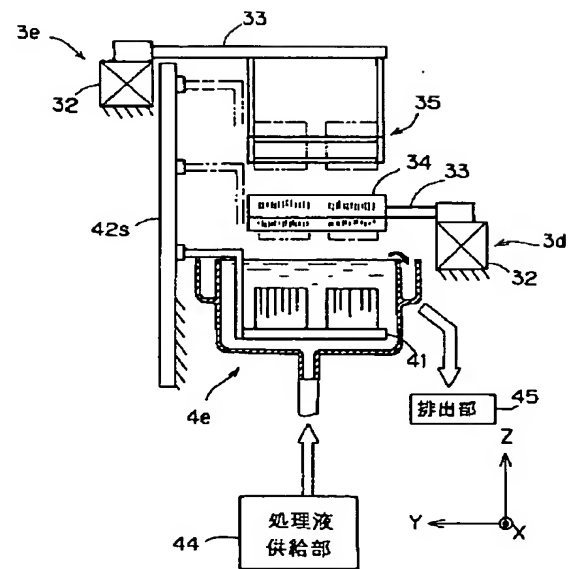
【図4】



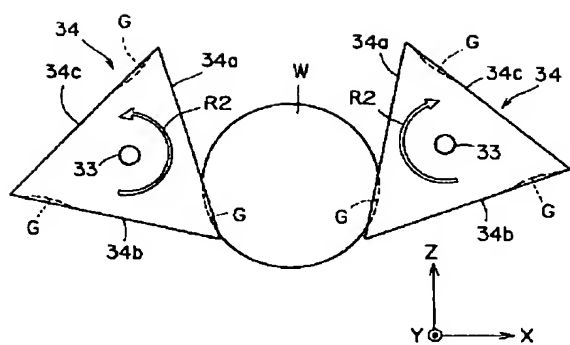
【図6】



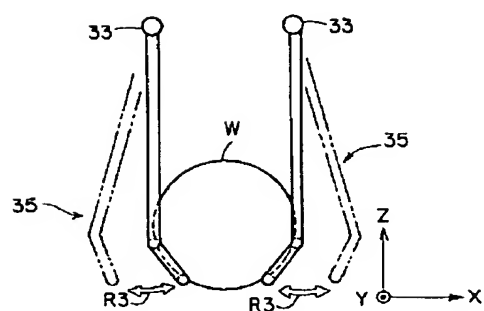
【図7】



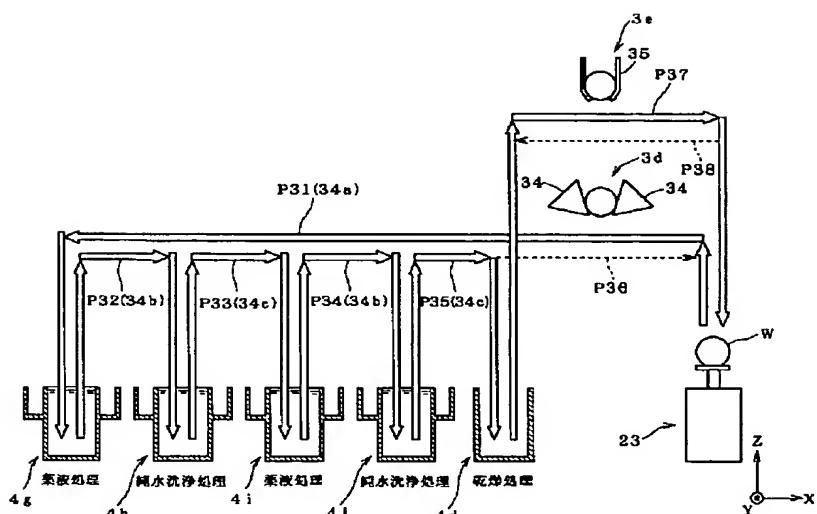
【図8】



【図9】



【図10】



【図11】

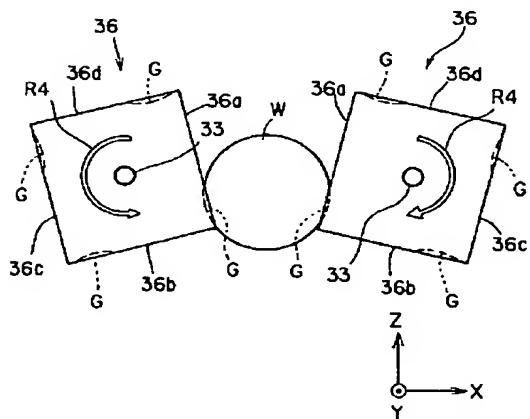


Figure 1 is a schematic diagram of a semiconductor device manufacturing apparatus. The diagram illustrates a sequence of processing steps for a wafer (31). The steps are labeled 4g, 4h, 4i, 4j, and 4d, each corresponding to a specific processing unit. The units are connected by a transport system (P41(36a)) and a wafer (31) is shown being transported by a robot (3b) and then processed by a unit (36). The unit (36) is connected to a wafer (W) and a wafer (29). A coordinate system (X, Y, Z) is shown at the bottom right.

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CLAIMS

[Claim(s)]

[Claim 1] Two or more processing sections which are the substrate processors which perform a series of predetermined processings to a substrate, and perform predetermined processing to the aforementioned substrate, Two or more conveyance meanses to convey the aforementioned substrate among two or more aforementioned processing sections, *****, a delivery means to perform delivery of the conveyance means of the aforementioned plurality respectively and the aforementioned substrate of two or more aforementioned processing sections, The substrate processor which **** and is characterized by receiving the aforementioned substrate only from some delivery meanses beforehand assigned about the conveyance means concerned among the processing sections of the aforementioned plurality respectively of two or more aforementioned conveyance meanses.

[Claim 2] The substrate processor with which it is a substrate processor according to claim 1, and each delivery means of two or more aforementioned processing sections is characterized by passing the aforementioned substrate only to the specific conveyance means of 1 of two or more aforementioned conveyance meanses.

[Claim 3] The substrate processor characterized by being a substrate processor according to claim 1 or 2, arranging two or more aforementioned processing sections in the predetermined direction, and two or more aforementioned conveyance meanses conveying the aforementioned substrate only in the aforementioned predetermined direction.

[Claim 4] Two or more processing sections which are the substrate processors which perform a series of predetermined processings to a substrate, are arranged in the predetermined direction, and perform predetermined processing to the aforementioned substrate, The 1st and the 2nd conveyance means of conveying the aforementioned substrate in the aforementioned predetermined direction, *****, a delivery means of two or more aforementioned processing sections to perform delivery of the above 1st and the 2nd conveyance means, and the aforementioned substrate, respectively, A straight-line-like guidance means to **** and to guide conveyance of the direction of respectively predetermined [of the aforementioned substrate / aforementioned] of the above 1st and the 2nd conveyance means, The substrate processor which it ****, and the aforementioned guidance means of the above 1st and the 2nd conveyance means is arranged in parallel mutually, and is characterized by receiving the aforementioned substrate only from some delivery meanses of the processing sections of the aforementioned plurality respectively of the above 1st and the 2nd conveyance means.

[Claim 5] The substrate processor characterized by being a substrate processor according to claim 4, and for the aforementioned predetermined direction being horizontally suitable, and arranging the aforementioned guidance means of the above 1st and the 2nd conveyance means in parallel mutual up and down.

[Claim 6] The substrate processor characterized by being a substrate processor according to claim 4, and for the aforementioned predetermined direction being horizontally suitable, and arranging mutually the aforementioned guidance means of the above 1st and the 2nd conveyance means at offset parallel.

[Claim 7] The substrate processor characterized by being a substrate processor according to

claim 4, and for the aforementioned predetermined direction being horizontally suitable, and .
arranging two or more aforementioned processing sections between the aforementioned guidance
meanses of the above 1st and the 2nd conveyance means.

[Claim 8] The substrate processor characterized by being a substrate processor according to
claim 4 to 7, and the aforementioned delivery means being a rise-and-fall means to make it go up
and down the aforementioned substrate.

[Claim 9] The substrate processor with which it is a substrate processor according to claim 4 to 8,
and the conveyance means of the above 1st is characterized by having further the attaching part
which has two or more maintenance plane groups contacted and held to the aforementioned
substrate, and the change means which changes two or more aforementioned maintenance plane
groups according to the processing stage of the aforementioned substrate received from the
aforementioned delivery means.

[Claim 10] One pair of axes of rotation parallel to each other for whom it is a substrate processor
according to claim 9, and the aforementioned attaching part is horizontally suitable, One pair of
maintenance boards with which it is attached along with each of the one aforementioned pair of
axes of rotation, and front ***** is a maintenance side, ***** and each 1 maintenance side of the
one aforementioned pair of maintenance boards serves as a 1 maintenance plane group of two or
more aforementioned maintenance plane groups by making a pair. The aforementioned substrate is
held so that the rim section of the aforementioned substrate may turn to the direction as the one
aforementioned pair of axes of rotation where the normal of the principal plane of the
aforementioned substrate is almost the same in contact with the aforementioned 1 maintenance
plane group. The substrate processor characterized by the aforementioned change means being a
means to rotate the one aforementioned pair of axes of rotation for the one aforementioned pair of
maintenance boards as a center, respectively.

[Claim 11] One pair of axes of rotation parallel to each other for whom it is a substrate processor
according to claim 9, and the aforementioned attaching part is horizontally suitable, the *****
multiple which makes a medial axis each of the one aforementioned pair of axes of rotation — with
one pair of supporters which are pillar-shaped and make a maintenance side a field parallel to the
aforementioned medial axis ***** and each 1 maintenance side of the one aforementioned pair of
supporters serves as a 1 maintenance plane group of two or more aforementioned maintenance
plane groups by making a pair. The aforementioned substrate is held so that the rim section of the
aforementioned substrate may turn to the direction as the one aforementioned pair of axes of
rotation where the normal of the principal plane of the aforementioned substrate is almost the
same in contact with the aforementioned 1 maintenance plane group. The substrate processor
characterized by the aforementioned change means being a means to rotate the one
aforementioned pair of axes of rotation for the one aforementioned pair of supporters as a center,
respectively.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] In case this invention manufactures the glass substrate used for manufacture of a semiconductor substrate, a liquid crystal display, etc. (henceforth a "substrate"), it relates to the substrate processor which processes to a substrate using two or more processing sections.

[0002]

[Description of the Prior Art] As an example of the substrate processor which processes a substrate in two or more processing sections, there is a substrate processor which performs medical fluid processing of etching, resist film ablation, etc. on the surface of a substrate. In such substrate processor, it has the medical fluid tub which stored the medical fluid, and the pure water washing tub which stored pure water as a many tub type substrate processor, and there are some which a substrate is made immersed one by one at a medical fluid tub and a pure water washing tub, and process to a substrate (a medical fluid tub and a pure water washing tub are only hereafter called "a medical fluid and pure water washing tub"). Moreover, in such a substrate processor, the substrate which the last pure water washing processing completed is equipped also with the drying room which performs dryness processing.

[0003] There are some which perform medical fluid processing and pure water washing processing without making air touched with a substrate in supplying a medical fluid and pure water by turns one by one as a single tub type substrate processor into a substrate processor at one a medical fluid and a pure water washing tub, and on the other hand, replacing the medical fluid and pure water in a medical fluid and a pure water washing tub by turns one by one. Moreover, in such a substrate processor, there are also what equips the substrate which the last pure water washing completed with the drying room which performs dryness processing, and a thing performed to dryness processing in the one aforementioned medical fluid and pure water washing tub (medical fluid processing, and pure water washing processing and dryness processing are only hereafter called "processing").

[0004] Although it has the carrier robot which conveys a substrate to a processing tub, drying room, etc. in the above substrate processors, the medical fluid and pure water which have adhered to the substrate whenever it holds the substrate after processing to the attaching part holding the substrate of a carrier robot will adhere. However, since a substrate is what is influenced [big] as quality also to slight contamination, various devices it is made not to pollute a substrate are needed for the attaching part of a carrier robot.

[0005] Then, the mechanism which washes an attaching part to a substrate processor, or is dried is established, and it is made to convey by holding a substrate using the attaching part which always performed washing and dryness.

[0006]

[Problem(s) to be Solved by the Invention] However, in having established the mechanism which washes an attaching part to a substrate processor, or is dried, while the whole substrate processor will become large, equipment itself will become complicated. Moreover, a throughput will decrease in having washed the attaching part, whenever it held the substrate.

[0007] Then, this invention was made in view of the above-mentioned technical problem, and it aims at offering the substrate processor which can aim at miniaturization of equipment, and improvement in a throughput, without being alike in if washing and dryness of the attaching part of a carrier robot being made unnecessary, and making the mechanism of a substrate processor complicated more.

[0008]

[Means for Solving the Problem] Two or more processing sections which invention of a claim 1 is a substrate processor which performs a series of predetermined processings to a substrate, and perform predetermined processing to the aforementioned substrate, It has two or more conveyance meanses to convey the aforementioned substrate among two or more aforementioned processing sections. It has a delivery means to perform delivery of the conveyance means of the aforementioned plurality respectively and the aforementioned substrate of two or more aforementioned processing sections, and the aforementioned substrate is received only from some delivery meanses beforehand assigned about the conveyance means concerned among the processing sections of the aforementioned plurality respectively of two or more aforementioned conveyance meanses.

[0009] Invention of a claim 2 is a substrate processor according to claim 1, and each delivery means of two or more aforementioned processing sections passes the aforementioned substrate only to the specific conveyance means of 1 of two or more aforementioned conveyance meanses.

[0010] Invention of a claim 3 is a substrate processor according to claim 1 or 2, two or more aforementioned processing sections are arranged in the predetermined direction, and two or more aforementioned conveyance meanses convey the aforementioned substrate only in the aforementioned predetermined direction.

[0011] Two or more processing sections which invention of a claim 4 is a substrate processor which performs a series of predetermined processings to a substrate, are arranged in the predetermined direction, and perform predetermined processing to the aforementioned substrate, It has the 1st and 2nd conveyance meanses to convey the aforementioned substrate in the aforementioned predetermined direction. It has a delivery means of two or more aforementioned processing sections to perform delivery of the above 1st and the 2nd conveyance means, and the aforementioned substrate, respectively. It has a straight-line-like guidance means to guide conveyance of the direction of respectively predetermined [of the aforementioned substrate / aforementioned] of the above 1st and the 2nd conveyance means. The aforementioned guidance means of the above 1st and the 2nd conveyance means is arranged in parallel mutually, and the aforementioned substrate is received only from some delivery meanses of the processing sections of the aforementioned plurality respectively of the above 1st and the 2nd conveyance means.

[0012] Invention of a claim 5 is a substrate processor according to claim 4, the aforementioned predetermined direction is horizontally suitable and the aforementioned guidance means of the above 1st and the 2nd conveyance means is arranged in parallel mutual up and down.

[0013] Invention of a claim 6 is a substrate processor according to claim 4, the aforementioned predetermined direction is horizontally suitable and the aforementioned guidance means of the above 1st and the 2nd conveyance means is arranged mutually at offset parallel.

[0014] Invention of a claim 7 is a substrate processor according to claim 4, the aforementioned predetermined direction is horizontally suitable and two or more aforementioned processing sections are arranged between the aforementioned guidance meanses of the above 1st and the 2nd conveyance means.

[0015] Invention of a claim 8 is a substrate processor according to claim 4 to 7, and the aforementioned delivery means is a rise-and-fall means to make it go up and down the aforementioned substrate.

[0016] Invention of a claim 9 is a substrate processor according to claim 4 to 8, and has further a change means by which the conveyance means of the above 1st changes two or more aforementioned maintenance plane groups according to the processing stage of the aforementioned substrate thought to be the attaching part which has two or more maintenance plane groups contacted and held to the aforementioned substrate from the aforementioned delivery means.

[0017] One pair of axes of rotation parallel to each other for whom invention of a claim 10 is a substrate processor according to claim 9, and the aforementioned attaching part is horizontally suitable, It is attached along with each of the one aforementioned pair of axes of rotation, and has one pair of maintenance boards with which front ***** is a maintenance side. Each 1 maintenance side of the one aforementioned pair of maintenance boards serves as a 1 maintenance plane group of two or more aforementioned maintenance plane groups by making a pair. The aforementioned substrate is held so that the rim section of the aforementioned substrate may turn to the direction as the one aforementioned pair of axes of rotation where the normal of the principal plane of the aforementioned substrate is almost the same in contact with the aforementioned 1 maintenance plane group, and the aforementioned change means is a means to rotate the one aforementioned pair of axes of rotation for the one aforementioned pair of maintenance boards as a center, respectively.

[0018] One pair of axes of rotation parallel to each other for whom invention of a claim 11 is a substrate processor according to claim 9, and the aforementioned attaching part is horizontally suitable, Are pillar-shaped, the **** multiple which makes a medial axis each of the one aforementioned pair of axes of rotation — Have one pair of supporters which make a maintenance side a field parallel to the aforementioned medial axis, and each 1 maintenance side of the one aforementioned pair of supporters serves as a 1 maintenance plane group of two or more aforementioned maintenance plane groups by making a pair. The aforementioned substrate is held so that the rim section of the aforementioned substrate may turn to the direction as the one aforementioned pair of axes of rotation where the normal of the principal plane of the aforementioned substrate is almost the same in contact with the aforementioned 1 maintenance plane group, and the aforementioned change means is a means to rotate the one aforementioned pair of axes of rotation for the one aforementioned pair of supporters as a center, respectively.

[0019]

[Embodiments of the Invention]

<1. Form ><1.1 of the 1st operation Whole composition > drawing 1 is the perspective diagram showing the substrate processor 1 which is the form of implementation of one of this invention. Moreover, drawing 2 is drawing having shown the outline of arrangement of each component when turning to a direction and seeing the substrate processor 1 from a direction (+X) (-X).

[0020] This substrate processor 1 is two or more substrates W (it is only hereafter called "Substrate W"). This equipment the substrate W set to Cassette C as shown in drawing 1 It consists of processing units 4 which receive Substrate W from the taking-out admission into a club 2 delivered between the equipment exteriors, the conveyance section 3 which receives and conveys the substrate W carried in to the taking-out admission into a club 2, and the conveyance section 3, and perform a series of predetermined processings.

[0021] The taking-out admission into a club 2 sets the carried-in substrate (or just before taking out) W to Cassette C, and while it moves in the cassette base 21 temporarily put in order and laid in the direction of Y, and the direction of Y, rise and fall of it are enabled at a Z direction. Moreover, it consists of the pressure-from-below section 23 which thrusts up Substrate W from a lower part from the cassette C laid by the transfer robot 22 which can rotate centering on a shaft parallel to the Z-axis, and the transfer robot 22, and is passed to the conveyance section 3, and the cassette washing section 24 which washes the empty cassette C.

[0022] the [1st carrier-robot 3a which returns the substrate which the conveyance section 3 was movable only in the direction of X, passed the substrate W received from the pressure-from-below section 23 to the processing unit 4, and predetermined processing completed in the pressure-from-below section 23, and] — it consists of 2 carrier-robot 3b, and 2nd carrier-robot 3b is arranged in the right above position of 3a of the 1st carrier robot

[0023] the [the 1st and] — it has one pair at a time the maintenance board 31 with which 2 carrier robots are extended to 3a, and 3b is extended in the direction of Y, respectively, and as it is inserted into one pair of maintenance boards 31, two or more substrates of a standing-up posture are put in order in the direction of Y, and are held Moreover, one pair of these maintenance boards 31 are attached in the shaft 33 extended in the direction of Y, respectively (refer to drawing 2), and rotate these shafts as a center.

[0024] Drawing 3 (a) and (b) are the side elevations when turning to a direction and seeing the appearance of the maintenance board 31 in the state where Substrate W was held, from a direction (+Y), (-Y). As two maintenance boards 31 are shown in an arrow R1, only the same angle of rotation as opposite direction is mutually rotated centering on a shaft 33, and the maintenance sides 31a and 31b which are front reverse side both sides of each maintenance board 31 serve as a pair, and hold Substrate W. Namely, as shown in drawing 3 (a), when Substrate W is held and one maintenance board 31 has turned maintenance side 31a to Substrate W, the maintenance board 31 of another side has also always turned maintenance side 31a to Substrate W. As while shows drawing 3 (b), when the maintenance board 31 has turned maintenance side 31b to Substrate W, the maintenance board 31 of another side also always turns maintenance side 31b to Substrate W. By this, if the substrate W1 dried as shown in drawing 3 (a) is held using 1 pair of maintenance side 31a, and the substrate W2 to which the medical fluid adhered is held using 1 pair of maintenance side 31b as shown in drawing 3 (b) It becomes possible to hold the substrates W1 and W2 of two surface states using one pair of maintenance boards 31, without taking adhesion into consideration for the unnecessary liquid to Substrate W.

[0025] In addition, two or more slots G are formed in the direction perpendicular to the direction of Y so that the normal of the principal plane may turn to the direction of Y and Substrate W may be held in two maintenance sides 31a and 31b which are front reverse side both sides of each maintenance board 31. Two maintenance boards 31 arrange Substrate W in the state parallel to a Y-Z side in the meantime, both the maintenance board 31 is rotated after that, and as Substrate W is put, it is held.

[0026] the [the 1st and] — each maintenance board 31 of the 2 carrier robots 3a and 3b moves in the direction of X by the direct-acting means 32 (what combines a driving source and a guidance means) extended in the direction of X through a shaft 33 (refer to drawing 1 and drawing 2) therefore, the substrate W thrust up in the pressure-from-below section 23 — the [the 1st and] — it will be held by the 2 carrier robots 3a and 3b, and the processing unit 4 top will be conveyed in the direction of X

[0027] The processing unit 4 consists of medical fluid processing section 4a which performs medical fluid processing to Substrate W, pure water washing processing section 4b which performs pure water washing processing to Substrate W, a medical fluid and pure water processing section 4c, and 4d (henceforth [these are named generically and] the “processing section”) of the dryness processing sections which perform dryness processing to Substrate W. moreover, these processing sections are arranged together with the direction of X — having — **** — a this top — the [the 1st and] — the maintenance board 31 of the 2 carrier robots 3a and 3b moves

[0028] Medical fluid processing section 4a has medical fluid tub 43a which stores a medical fluid, and medical fluid tub 43a is connected to the processing liquid feed zone 44 which supplies a medical fluid as shown in drawing 2 . Moreover, it circulates through the medical fluid with which it began to overflow from medical fluid tub 43a to medical fluid tub 43a through the processing liquid feed zone 44 through the temperature control means and filtration means which it is discharged from the eccrisis section 45 and illustrated again. In this medical fluid tub 43a, medical fluid processing by high temperature and the high-concentration medical fluid is comparatively performed from a temperature control means being established and circulating the medical fluid.

[0029] Pure water washing processing section 4b has pure water washing tub 43b. Pure water washing tub 43b flushes and removes the medical fluid adhering to this substrate W with pure water, when the substrate W after pure water was supplied from the lower part, pure water overflowed the upper part and medical fluid processing was performed by medical fluid tub 43a is carried in.

[0030] A medical fluid and pure water washing processing section 4c have one medical fluid and pure water washing tub 43c. From the lower part of a medical fluid and pure water washing tub 43c, predetermined-time supply of a medical fluid and the pure water is carried out by turns one by one, respectively. By this, the inside of a medical fluid and pure water washing tub 43c replaces a medical fluid and pure water by turns. Therefore, after pure water washing processing is performed in pure water washing tub 43b, medical fluid processing and pure water washing processing are performed to the substrate W immersed in this medical fluid and pure water

washing tub 43c, without touching air.

[0031] In this medical fluid and pure water washing tub 43c, since a medical fluid and pure water are replaced by turns, compared with the medical fluid used by medical fluid tub 43a, medical fluid processing by the degree of low temperature and the low-concentration medical fluid is performed. In addition, about 4d of dryness processing sections, 43d of drying room where dryness processing is performed is prepared.

[0032] Moreover, medical fluid tub 43a, pure water washing tub 43b, and a medical fluid and pure water washing tub 43c have a rise-and-fall means 42 to make it go up and down the maintenance base 41 holding Substrate W, and the maintenance base 41 up and down, respectively. Although no less than 4d of dryness processing sections differs, as for the gestalt, they have the rise-and-fall means and maintenance base which take Substrate W in and out of 43d of drying room (illustration ellipsis). thereby — the [each processing section, the 1st, and] — delivery of Substrate W of the 2 carrier robots 3a and 3b is enabled, and they can perform now medical fluid processing, pure water washing processing, and dryness processing to Substrate W

[0033] <1.2 Operation of > of operation, next this substrate processor 1 is explained using drawing 1 and drawing 4 .

[0034] First, as shown in drawing 1 , Substrate W is conveyed by the means of a conveyance vehicle etc. from the equipment exterior in the state where it was set to Cassette C, and is laid on the cassette base 21. The cassette laid in the cassette base 21 is laid in the pressure-from-below section 23 by the transfer robot 22. In addition, 2 installation of Cassette C is attained simultaneously at the pressure-from-below section 23, and after Cassette C rotates 90 degrees centering on the shaft which turns to a Z direction, the substrate W inside two cassette C thrusts up upwards simultaneously, and is taken out here. The cassette C which became empty is again grasped by the transfer robot 22, and is stored in the cassette washing section 24, and washing processing is performed while a series of predetermined processings are performed to Substrate W.

[0035] Being held at 1st carrier-robot 3a, as shown in drawing 4 , the substrate W thrust up by the pressure-from-below section 23 is conveyed to medical fluid processing section 4a, as shown in an arrow P11. In addition, Substrate W is held by 1 pair of maintenance side 31a (refer to drawing 3 (a)) of the maintenance board 31 of 1st carrier-robot 3a at this time.

[0036] The substrate W conveyed to medical fluid processing section 4a is delivered to the maintenance base 41 from 1st carrier-robot 3a, and is flooded with the medical fluid inside medical fluid tub 43a by the rise-and-fall means 42. Medical fluid processing is performed to Substrate W here, and it is taken out by the rise-and-fall means 42 after that.

[0037] The substrate W taken out from medical fluid tub 43a is again passed to 1st carrier-robot 3a from the maintenance base 41. At this time, 1st carrier-robot 3a is received in 1 pair of maintenance side 31b (refer to drawing 3 (b)) of the maintenance board 31. Therefore, although the medical fluid adhering to Substrate W adheres to maintenance side 31b, it does not adhere to maintenance side 31a.

[0038] Next, 1st carrier-robot 3a which received Substrate W from medical fluid processing section 4a conveys Substrate W to pure water washing processing section 4b, as shown in an arrow P12, and it passes Substrate W to the maintenance base 41 like medical fluid processing section 4a. the [and] — in order to receive the substrate W by which a degree should be processed, 1 carrier-robot 3a moves to the pressure-from-below section 23 again, as shown in an arrow P14 Pure water washing processing section 4b performs pure water washing processing to the received substrate W, and flushes the medical fluid adhering to Substrate W. And Substrate W is passed to the 2nd carrier robot to 3b. At this time, 2nd carrier-robot 3b receives Substrate W in maintenance side 31a, and pure water adheres to this maintenance side 31a.

[0039] 2nd carrier-robot 3b which received Substrate W from pure water washing processing section 4b passes Substrate W to a medical fluid and pure water washing processing section 4c, as shown in an arrow P13.

[0040] As mentioned above, by 1st carrier-robot 3a, it is used only in order that 1 pair of maintenance side 31a of the maintenance board 31 may hold the substrate W immediately after carrying in to the substrate processor 1, and 1 pair of maintenance side 31b is used only in order

to receive the substrate W after the medical fluid processing by medical fluid processing section 4a. Therefore, liquid will not adhere to maintenance side 31a, and only a medical fluid will adhere to maintenance side 31b.

[0041] The medical fluid and pure water washing processing section 4c which received Substrate W from 2nd carrier-robot 3b make it go up and down Substrate W, performs medical fluid processing and pure water washing processing of further others to Substrate W, and passes this substrate W to 2nd carrier-robot 3b. At this time, 2nd carrier-robot 3b holds Substrate W using 1 pair of maintenance side 31a of two maintenance boards 31. Although pure water has adhered since maintenance side 31a touches the substrate W passed from pure water washing processing section 4b at this time, since pure water has adhered, a problem does not have the substrate W passed from a medical fluid and pure water washing processing section 4c.

[0042] 2nd carrier-robot 3b conveys the substrate W received from a medical fluid and pure water washing processing section 4c to the upper part of 4d of dryness processing sections, as shown in an arrow P15. Here, the substrate W which the maintenance base of 4d of dryness processing sections received Substrate W, performed dryness processing, and dried is again passed to 2nd carrier-robot 3b. At this time, 2nd carrier-robot 3b receives Substrate W using 1 pair of maintenance side 31b of the maintenance board 31. That is, it is used only in order to hold the substrate W to which, as for maintenance side 31a, pure water after pure water washing processing was performed in pure water washing processing section 4b, and a medical fluid and pure water washing processing section 4c adhered in 2nd carrier-robot 3b, and maintenance side 31b will be used only in order to hold the substrate W dried after dryness processing was performed. In addition, as shown in an arrow P16, 2nd carrier-robot 3b which received Substrate W from 4d of dryness processing sections conveys Substrate W to the pressure-from-below section 23, and returns Substrate W in the pressure-from-below section 23. And in order to receive the following substrate, as shown in an arrow P17, it moves to pure water washing processing section 4b.

[0043] In the pressure-from-below section 23, the cassette C washed in the cassette washing section 24 is arranged using the transfer robot 22, and the substrate W after processing is stored in this (refer to drawing 1). And the cassette C by which the substrate W to which processing was performed was set is laid in the cassette base 21, and is taken out in the equipment exterior.

[0044] <1.3 Although the composition and operation of the substrate processor 1 in the form of the 1st operation have been explained more than effect > this substrate processor 1 — such — the [the 1st and] — it having the 2 carrier robots 3a and 3b, and, since each carrier robot has two pairs holding Substrate W of a maintenance side Each maintenance side can hold the substrate W of a specific surface state by using these maintenance sides 31a and 31b properly. Consequently, the adhesion of liquid and a pollutant which has a bad influence on Substrate W can be prevented, without giving washing and dryness to maintenance board 31 the very thing. Moreover, thereby, miniaturization of equipment and improvement in a throughput can be aimed at.

[0045] furthermore — this substrate processor 1 — the [the 1st and] — since the 2 carrier robots 3a and 3b are arranged up and down, reduction of the occupancy floor space of equipment can also be aimed at Moreover, each processing section is arranged in the direction of X, in this substrate processor 1, since the direct-acting means 32 and the rise-and-fall means 42 are the move mechanisms of one shaft, positioning in the case of delivery of Substrate W can be performed correctly, it is quick and reliable delivery can be realized easily.

[0046] <1.4 Arrangement modification > drawing 5 of a carrier robot is drawing showing that (sign 3in drawing c) by which arrangement of 2nd carrier-robot 3b was changed in the substrate processor 1 which is the gestalt of implementation of the 1st of this invention, and is drawing equivalent to drawing 2 in the gestalt of the 1st operation.

[0047] 2nd carrier-robot 3b this 2nd carrier-robot 3c is indicated to be to drawing 2 — differing — the direct-acting means 32 — the direct-acting means 32 of 1st carrier-robot 3a — receiving — the side — the upper part — being parallel (to offset parallel) — it is arranged Therefore, the shaft 33 with which the maintenance board 31 of 2nd carrier-robot 3c was attached is longer than the thing of 1st carrier-robot 3a.

[0048] the [thus, / the 1st and] — distance of the vertical direction of the maintenance board 31 of both carrier robots can be made small compared with the substrate processor 1 of the gestalt of the 1st operation by arranging the 2 carrier robots 3a and 3c in parallel in a completely different class. Moreover, 42s of rise-and-fall meanses prepared in each processing section can be low pressed down compared with the thing of the gestalt of the 1st operation. Consequently, this substrate processor is low pressed down to the height direction compared with the substrate processor 1 of the gestalt of the 1st operation. Thereby, since it has two carrier robots, the problem that an equipment overall height becomes high is conquered. Moreover, the conveyance path of the height direction of Substrate W will also be pressed down short, and a throughput's improves.

[0049] Furthermore, with the gestalt of the 1st operation, although the number of carrier robots is two, it may not pass over this for two things to have been shown on [of explanation] expedient, but, of course, it may be three or more. In this case, if the carrier robot which receives the substrate of the specific surface state taken out from the processing section of a specific kind is decided to be a specific thing (you may be two or more), it is possible to make unnecessary washing and dryness of the part holding Substrate W, and the above-mentioned effect can be acquired. In addition, you may make it arbitrary carrier robots receive depending on the content of processing. Improvement in a throughput can be aimed at, so that there are many carrier robots, even if it is such a case.

[0050] <1.5 Modification > drawing 6 of a processing unit is the cyclegraph showing the example which transformed the composition of the processing unit 4 of the substrate processor 1 shown in the gestalt of the 1st operation. The processing unit 4 is constituted from medical fluid processing section 4e which performs only medical fluid processing, 4f of pure water washing processing sections which perform only pure water washing processing, and 4d of dryness processing sections which perform dryness processing by this modification. Medical fluid processing section 4e has the medical fluid tub like the gestalt of the 1st operation. Moreover, it has the washing tub in which only pure water is supplied and no less than 4f of pure water washing processing sections is stored. In addition, about the taking-out admission into a club 2 and the conveyance section 3, it is the same as that of the gestalt of the 1st operation.

[0051] In this substrate processor, 1st carrier-robot 3a receives Substrate W from the pressure-from-below section 23 using 1 pair of maintenance side 31a of the maintenance board 31, as shown in an arrow P21, it conveys, and Substrate W is passed to medical fluid processing section 4e. Although Substrate W is again passed to 1st carrier-robot 3a after Substrate W is immersed and is processed in the medical fluid tub of medical fluid processing section 4e, 1st carrier-robot 3a holds Substrate W using 1 pair of maintenance side 31b at this time. 1st carrier-robot 3a conveys Substrate W, as shown in an arrow P22, it passes it to 4f of pure water washing processing sections, and as shown in an arrow P23, it moves the following substrate to reception again to the pressure-from-below section 23.

[0052] 2nd carrier-robot 3b receives the substrate W to which pure water washing processing was performed using 1 pair of maintenance side 31a of the maintenance board 31 from 4f of pure water washing processing sections, as shown in an arrow P24, it conveys it, and it is passed to 4d of dryness processing sections. The substrate W to which dryness processing was performed is again passed to 2nd carrier-robot 3b, and as shown in an arrow P25, it is conveyed to the pressure-from-below section 23. At this time, 2nd carrier-robot 3b conveys Substrate W using 1 pair of maintenance side 31b. And if Substrate W is passed to the pressure-from-below section 23, in order to receive the following substrate, as shown in an arrow P26 to 4f of pure water washing processing sections, it moves.

[0053] Thus, in this modification, it is used in order that 1 pair of maintenance side 31a of one pair of maintenance boards 31 of 1st carrier-robot 3a may convey the unsettled substrate W, and 1 pair of maintenance side 31b is used in order to convey the substrate W after medical fluid processing. Moreover, it is used in order that 1 pair of maintenance side 31a of one pair of maintenance boards 31 of 2nd carrier-robot 3b may convey the substrate W after pure water washing processing, and 1 pair of maintenance side 31b is used in order to convey the substrate W after dryness processing.

[0054] <2. Gestalt > drawing 7 of the 2nd operation is drawing which turned to and looked at the direction from the direction like drawing 2 in the gestalt of the 1st operation of the substrate processor which is the gestalt of implementation of the 2nd of this invention (+X) (-X), and is illustrating only the same component as drawing 2. Moreover, drawing 8 is drawing showing the supporter 34 which replaces with the maintenance board 31 in the gestalt of the 1st operation, and is attached in the 3d of the 1st carrier robot, and drawing 9 is drawing showing the maintenance arm 35 attached like 2nd carrier-robot 3e. Furthermore, drawing 10 is drawing showing operation of this substrate processor.

[0055] As shown in drawing 7, the 3d of the 1st carrier robot serves as the supporter 34 of the two right triangle poles which replace with two maintenance boards 31 in the form of the 1st operation, and are extended in the direction of Y. That is, although the maintenance sides 31a and 31b which are the 2nd page of the front reverse sides were changed according to the surface state of Substrate W with the maintenance board 31, the maintenance sides 34a, 34b, and 34c which are three sides of the triangle pole play the role with the form of this operation. It is drawing 8 which showed the state where turned to the direction and this supporter 34 was seen from the direction (+Y) (-Y). It rotates in the direction of an arrow R2 centering on a shaft 33 like the form of the 1st operation, each three maintenance side of two supporters 34 serves as a pair, and it changes, and two or more slots G are formed in each maintenance side so that Substrate W can be held with a standing-up posture.

[0056] Moreover, on both sides of the processing unit 4, 2nd carrier-robot 3e counters with the 3d of the 1st carrier robot, and is prepared, and the maintenance arm 35 was attached in each of one pair of shafts 33 extended through the upper part of 42s of rise-and-fall meanses of each processing section. It is drawing 9 which showed the state where turned to the direction and this maintenance arm 35 was seen from the direction (-Y) (+Y), and Substrate W is held and it holds by opening and closing, as the maintenance arm 35 shows an arrow R3.

[0057] As shown in drawing 10, the processing unit 4 of this substrate processor The 4g of the 1st medical fluid processing sections, The 4h of the 1st pure water washing processing sections, 2nd medical fluid processing section 4i, 2nd pure water washing processing section 4j, and 4d of dryness processing sections are arranged toward the direction from the direction (-X) in this order (+X), and a medical fluid and pure water are stored by each medical fluid processing section and each pure water washing processing section. the [in addition, / the 1st and] — the medical fluid currently stored by 2 medical-fluid processing sections 4g and 4i is of the same kind or the thing (harmful gas is not generated) which does not produce a problem even if it mixes Moreover, other components are the same as that of the form of the 1st operation.

[0058] Hereafter, operation of this substrate processor is explained using drawing 10.

[0059] First, the 3d of the 1st carrier robot is conveyed, as Substrate W is received from the pressure-from-below section 23 using 1 pair of maintenance side 34a and it is shown in an arrow P31, and it is passed to the 4g of the 1st medical fluid processing sections. And as shown in arrows P32, P33, P34, and P35, in order, use 1 pair of maintenance side 34b from the 4g of the 1st medical fluid processing sections, receive Substrate W, and the 4h of the 1st pure water washing processing sections is passed. Receive Substrate W from the 4h of the 1st pure water washing processing sections using 1 pair of maintenance side 34c, and 2nd medical fluid processing section 4i is passed. Substrate W is received from 2nd medical fluid processing section 4i using 1 pair of maintenance side 34b, 2nd pure water washing processing section 4j is passed, Substrate W is received from 2nd pure water washing processing section 4j using 1 pair of maintenance side 34c, and 4d of dryness processing sections is passed. Then, as shown in an arrow P36, it returns to the 4g of the 1st medical fluid processing sections.

[0060] On the other hand, 2nd carrier-robot 3e is conveyed, as Substrate W is received from 4d of dryness processing sections and it is shown in an arrow P37, it is passed to the pressure-from-below section 23, and as shown in an arrow P38, it returns to the original position.

[0061] By performing such operation, maintenance side 34a of a supporter 34 will contact the unsettled substrate W, maintenance side 34b will contact the substrate W to which the medical fluid adhered, and maintenance side 34c will contact the substrate W to which pure water adhered. the [moreover, / the 1st and] — since it is [that the medical fluid of 2 medical-fluid processing

sections 4g and 4i is of the same kind or] mixable, a problem is not produced even if it receives Substrate W from these processing sections using maintenance side 34b. Therefore, like the form of the 1st operation, washing and dryness of a supporter 34 or the maintenance arm 35 can be made unnecessary, and miniaturization of equipment and improvement in a throughput can be aimed at.

[0062] Moreover, with the form of this operation, the 1st and distance of Substrate W which can determine arrangement of each carrier robot easily, and is held at a supporter 34 and the maintenance arm 35 since 3d and 3e can be left enough and can be arranged the 2nd carrier robot can be made small, an equipment overall height can be pressed down low or improvement in the throughput by short vertical movement can be aimed at.

[0063] <3. Form > drawing 11 of the 3rd operation is drawing showing the supporter 36 of the substrate processor which is the form of implementation of the 3rd of this invention, and drawing 12 is drawing showing operation.

[0064] In this substrate processor, compared with the substrate processor 1 of the form of the 1st operation, a base as the 3f of the 1st carrier robot replaced with the maintenance board 31 and shown in drawing 11 is different in that it has the supporter 36 which carried out the square prism, and the processing unit 4 also serves as a form of the 2nd operation, and same form. the [however, / the 1st and] — alkali etc. must not mix with an acid the medical fluid of each other currently stored by 2 medical-fluid processing sections 4g and 4i

[0065] Since a supporter 36 is the square pole as shown in drawing 11, it has many one more pair of maintenance sides to the supporter 34 in the gestalt of the 2nd operation. That is, each supporter 36 has four maintenance sides [36a 36b, 36c, and 36d] maintenance sides, and by rotating to opposite direction centering on a shaft 33, as both the supporters 36 show an arrow R4, the maintenance side where both the supporters 36 correspond makes a pair, and it holds Substrate W. Therefore, the substrate W of four different surface states can be held now.

[0066] Moreover, 2nd carrier-robot 3b has one pair of maintenance board 31 which has two maintenance sides 31a and 31b like the form of the 1st operation.

[0067] As shown in drawing 12, first, the 3f of the 1st carrier robot receives Substrate W from the pressure-from-below section 23 using 1 pair of maintenance side 36a, and operation of such the 1st and this substrate processor equipped with 3f and 3b the 2nd carrier robot conveys it, as shown in an arrow P41, and is passed to the 4g of the 1st medical fluid processing sections. Hereafter, as shown in arrows P42, P43, and P44 in order of, it conveys from the 4g of the 1st medical fluid processing sections using maintenance side 36b to the 4h of the 1st pure water washing processing sections. It conveys from the 4h of the 1st pure water washing processing sections using maintenance side 36c to 2nd medical fluid processing section 4i, and conveys from 2nd medical fluid processing section 4i using 36d of maintenance sides to 2nd pure water washing processing section 4j. Then, in order to receive the following substrate, as shown in an arrow P45, it moves to the pressure-from-below section 23.

[0068] Next, 2nd carrier-robot 3b conveys Substrate W from 2nd pure water washing processing section 4j using maintenance side 31a to 4d of dryness processing sections, as shown in arrows P46 and P47, and it conveys it from 4d of dryness processing sections using maintenance side 31b to the pressure-from-below section 23. Then, in order to receive the following substrate, as shown in an arrow P48, it moves to 2nd pure water washing processing section 4j.

[0069] since reception of the substrate W from each processing section is performed by the above conveyance operation in respect of the 1st and the maintenance from which 3f and 3b differed the 2nd carrier robot — even if — the [the 1st and] — Substrate W can be dealt with safely, without performing a supporter 36, washing of the maintenance board 31, etc., even if the medical fluid currently stored by 2 medical-fluid processing sections 4g and 4i must not be mixed. Of course, miniaturization of equipment and improvement in a throughput as well as the gestalt of the 1st operation can be aimed at.

[0070] <4. Although the form of implementation of this invention has been explained more than modification >, this invention is not limited to the form of the above-mentioned implementation.

[0071] For example, although the number of carrier robots was two with the form of the above-mentioned implementation, you may be three or more like previous statement. Moreover, the

number of the processing sections of the processing unit 4 is not limited to the form of the above-mentioned implementation, either. These are suitably determined according to the contents of processing.

[0072] Moreover, you may be what form, as long as the maintenance board 31 or supporters 34 and 36 of a carrier robot are not limited to the form of the above-mentioned implementation, either and it can convey the substrate of two or more surface states. For example, while enabling change of the interval between one pair of supporters, using a right hexagonal-prism-like thing as a supporter, six sides are changed and you may make it hold. In addition, change of the interval between one pair of supporters is enabled for making the interval between both supporters larger than the diameter of a substrate in order to move a supporter under the substrate.

[0073] Moreover, it is easy to be natural, even if it starts processing of the following substrate, before processing of Substrate W is completed.

[0074] Moreover, you may make it hold the substrate W of a surface state which is different when possible in respect of the same maintenance, and may make it hold the substrate W of the same surface state in a different maintenance side in the carrier robot which has maintenance sides, such as the maintenance board 31 and supporters 34 and 36.

[0075] In addition, it can change suitably also about the content of processing, or delivery of the substrate W to a carrier robot.

[0076]

[Effect of the Invention] As explained above, since a substrate is received only from the delivery means of a part of processing sections beforehand assigned among the processing sections of plurality respectively of two or more conveyance meanses, by invention according to claim 1, each conveyance means can convey only the substrate of the specific surface state which finished predetermined processing. The need of this washing the attaching part holding the substrate of each conveyance means, or drying can be abolished, and miniaturization of a substrate processor and improvement in a throughput can be aimed at.

[0077] In invention according to claim 2, since the delivery means of each processing section passes a substrate only to the specific conveyance means of 1, each conveyance means will convey only the substrate of the specific surface state which finished predetermined processing. Thereby, like invention according to claim 1, the need of washing the attaching part holding the substrate of each conveyance means, or drying can be abolished, and miniaturization of a substrate processor and improvement in a throughput can be aimed at.

[0078] By invention according to claim 3, since two or more processing sections are arranged in the predetermined direction and two or more conveyance meanses convey a substrate only in the predetermined direction, a substrate can be conveyed to each processing section with simple structure.

[0079] In invention according to claim 4, since the delivery means of a part of processing sections of the processing section of plurality respectively to the substrate of the 1st and 2nd conveyance meanses is received, each conveyance means can convey only the substrate of the specific surface state which finished predetermined processing. The need of this washing the attaching part holding the substrate of each conveyance means, or drying can be abolished, and miniaturization of a substrate processor and improvement in a throughput can be aimed at.

[0080] In invention according to claim 5, since the guidance means of the 1st and 2nd conveyance meanses is arranged in parallel up and down, the floor space which a substrate processor occupies can be pressed down small.

[0081] In invention according to claim 6, since the guidance means of the 1st and 2nd conveyance meanses is arranged at offset parallel While being able to make small distance of the vertical direction of the substrate held at the 1st conveyance means, and the substrate held at the 2nd conveyance means and being able to press down the overall height of a substrate processor low In order to receive a substrate from each processing section, distance which must move a substrate can be shortened, and improvement in a throughput can be aimed at.

[0082] In invention according to claim 7, since two or more processing sections are arranged between the guidance meanses of the 1st and 2nd conveyance meanses, in addition to an effect of the invention according to claim 6, arrangement of each conveyance means can be designed easily.

[0083] In invention according to claim 8, since a delivery means is a rise-and-fall means to make it go up and down a substrate, the substrate in delivery of a substrate can be positioned correctly.

[0084] It can hold easily with one conveyance means, without polluting the substrate of a different surface state with invention according to claim 9, since a maintenance plane group is changed and a substrate is held.

[0085] In invention according to claim 10, since the maintenance side which is a front rear face of one pair of maintenance boards is changed and a substrate is held, it can hold easily, without polluting the substrate of two surface states.

[0086] In invention according to claim 11, since a maintenance side is changed and a substrate is held by rotating the supporter of the shape of one pair of **** multiple pillar focusing on a medial axis, it can hold easily, without polluting the substrate of three or more different surface states.

[Translation done.]

* NOTICES *

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective diagram of the whole substrate processor in the gestalt of implementation of the 1st of this invention.

[Drawing 2] It is the side elevation showing the composition of the substrate processor shown in drawing 1 .

[Drawing 3] It is the side elevation showing a maintenance board.

[Drawing 4] It is drawing showing operation of the substrate processor shown in drawing 1 .

[Drawing 5] It is the side elevation showing the modification of 1 of the substrate processor shown in drawing 1 .

[Drawing 6] It is drawing showing operation of other modifications of the substrate processor shown in drawing 1 .

[Drawing 7] It is the side elevation showing the composition of the substrate processor in the gestalt of implementation of the 2nd of this invention.

[Drawing 8] It is the side elevation showing a supporter.

[Drawing 9] It is the side elevation showing a maintenance arm.

[Drawing 10] It is drawing showing operation of the substrate processor shown in drawing 7 .

[Drawing 11] It is the side elevation showing a supporter.

[Drawing 12] It is drawing showing operation of the substrate processor in the gestalt of implementation of the 3rd of this invention.

[Description of Notations]

1 Substrate Processor

3a, 3d, 3f The 1st carrier robot

3b, 3c, 3e The 2nd carrier robot

4 Processing Unit

4a Medical fluid processing section

4b Pure water washing processing section

4c A medical fluid and the pure water washing processing section

4d Dryness processing section

4e Medical fluid processing section

4f Pure water washing processing section

31 Maintenance Board

31a, 31b Maintenance side

32 Direct-acting Means

33 Shaft

34 Supporter

34a, 34b, 34c Maintenance side

36 Supporter

36a, 36b, 36c, 36d Maintenance side

41 Maintenance Base

42 Rise-and-Fall Means

G Slot

R1, R2, R3 Arrow
W Substrate

[Translation done.]